भारतीय मानक
Indian Standard

IS 13497 : 2017
(Reaffirmed 2022)

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(पहला पुनरीक्षण)

Fusible Plug For Dissolved Acetylene Gas Cylinder — Specification

(First Revision)

ICS 23.020.30

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July 2017 **Price Group 4**

Gas Cylinders Sectional Committee, MED 16

FOREWORD

This Indian Standard (*First Revision*) was adopted by the Bureau of Indian Standards, after the draft finalized by the Gas Cylinders Sectional Committee had been approved by the Mechanical Engineering Divisional Council (MEDC).

This standard was first published in 1992. In this revision amendment has been incorporated and the following major changes have been made:

a) Provisions of checking by gauging inlet threads has been included;
b) Fixing of fusible plugs; and
c) Proforma of material test certificate.

Fusible plug is an operating part in the form of a plug of suitable low melting point material, usually a metal alloy, which closes the safety device channel under normal conditions and is intended to yield or melt at a predetermined temperature to permit the escape of gas. These fusible plugs are used in welded dissolved acetylene gas cylinders.

The taper thread specified in 4.1 and Fig. 2 of this standard is the same specified as l/8" - 27 NGT in ANSI B 57.1-1977 in 'Compressed gas cylinder valve outlet and inlet connections', published by American National Standard, USA.

Whilst all essential requirements have been set out in considerable details, other requirements are purposely left out to permit a reasonable degree of latitude to designers and users. Where provision is made in this standard for certain details to be settled by agreement between the purchaser and the manufacturer, it shall be understood that, where applicable, such details are subject to approval by the Chief Controller of Explosives, Nagpur.

While implementing this standard, the manufacturer and the inspection agency shall ensure compliance with statutory regulations.

The relevant SI units and corresponding conversion factors are given below for guidance:

$$\begin{aligned} 1\ \text{kgf/cm}^2 &= 98.066\,5\ \text{kPa (kilopascal)} = 10\ \text{m of Water column (WC)} \\ &= 0.098\,066\,5\ \text{MPa (Megapascal)} \\ &= 0.980\,665\ \text{bar} \end{aligned}$$

$$\text{Pressure 1Pa (Pascal)} = 1\ \text{N/m}^2$$

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2:1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FUSIBLE PLUG FOR DISSOLVED ACETYLENE GAS CYLINDER — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers requirements of fusible plug for welded type dissolved acetylene gas cylinder.

2 REFERENCES

The standards listed below contain provisions which through reference to this context constitute provisions of this standard.

At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1608 : 2005/ISO 6892 : 1998	Metallic materials — Tensile testing at ambient temperature (*third revision*)
5903 : 2014	Recommendation for safety device for gas cylinders (*first revision*)
15894 : 2011	Inspection gauges for checking Type 1(sizes 1, 2 and 3) taper threads of gas cylinder Valves and cylinder necks — Taper 1 in 16 on diameter — Specification

3 MATERIAL

3.1 Material composition of the body of the fusible plug shall be either extruded brass rod or wrought non-magnetic stainless steel. In case of brass material, copper content of brass shall not exceed 65 percent of copper. The actual composition of the fusible plug body shall be as per agreement between the purchaser and the manufacturer.

3.2 Physical Properties of Raw Material

The tensile strength and the elongation of the body determined according to IS 1608 shall be at least 3.45 MPa (35kgf/mm^2) and 18 percent respectively when measured on a gauge length of 5.65" S_0, S_0 being the original area of cross-section. Each batch of raw material shall be subject to tensile strength and elongation tests.

3.3 Test sample for tensile strength and elongation tests shall be taken from original raw material. The scale of sampling shall be in accordance with Annex A.

4 SCREW THREAD OF THE FUSIBLE PLUG

4.1 The fusible plugs shall have external taper screw thread of size 1/8" NGT. The principal dimensions shall be in accordance with Fig. 1. The wrenching size of the fusible plug shall be 12 mm (nominal).

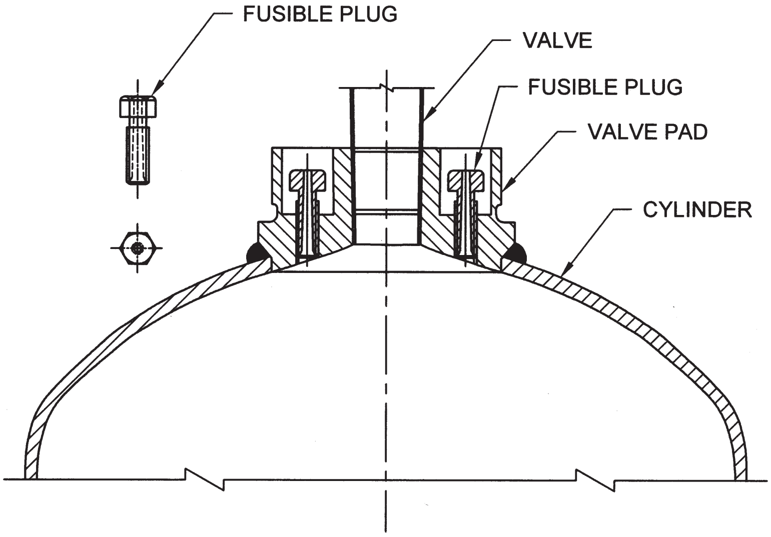


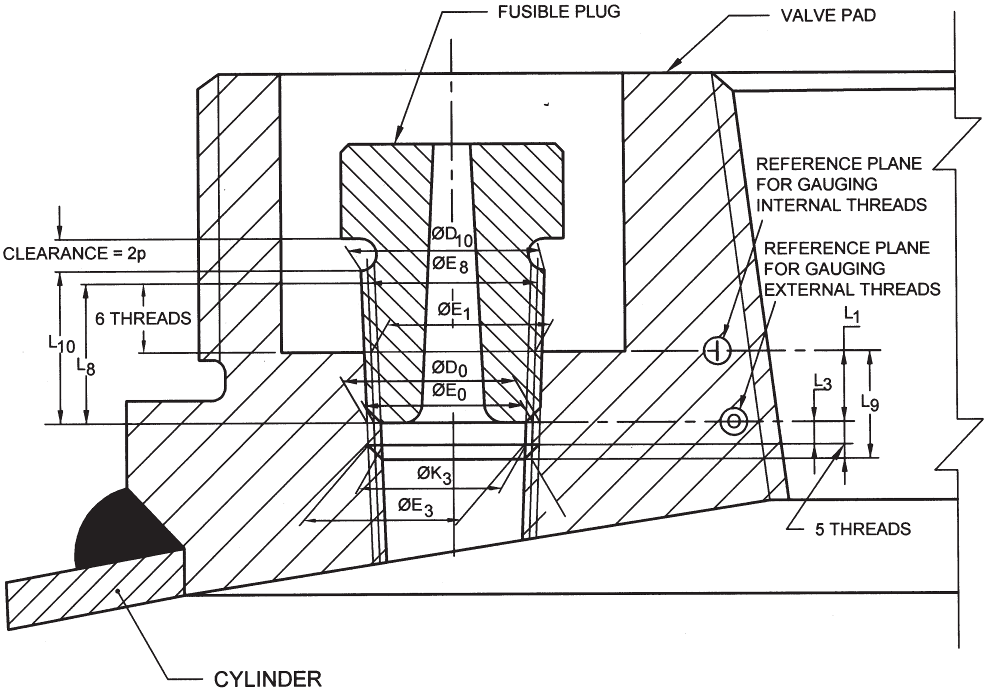
FIG. 1 GENERAL ARRANGEMENT SHOWING LOCATION OF FUSIBLE PLUGS ON WELDED CYLINDER

4.2 The fusible plug shall not be protrude out of bung/valve pad top face when fully tightened (*see* Fig 2).

4.3 The inlet thread of 1/8" NGT shall be checked by gauging to IS 15894.

5 TYPE OF SAFETY DEVICE

The type of safety device covered by this specification shall be FP-2 fusible plug according to IS 5903 utilizing a fusible alloy with yield temperature 100^{+4}_{-2} °C.



D = Major diameter
D_0 = 9.98
D_{10} = 10.68 (approx.)

E = Pitch diameter
E_0 = 9.23
E_1 = 9.49
E_3 = 9.06
E_8 = 9.84
K = Minor diameter
K_3 = 8.3 (Max)

Pitch = 0.941 (27 TPI)
L_1 = Standard handtight engagement
= 4.1
L_3 = 3 threads (for wrenching)
$L_1 + L_3$ = 6.92
L_8 = Length of full external threads
= 9.75
L_9 = Length of full roots (minimum) on internal threads
= 8.81
L_{10} = Overall length of external threads (approx.)
= 11.11
Diameter at small end of the fusible plug after chamfer of 45° = 8.33 (minimum)

All dimensions in millimetres.

Fig 2 Dimensions for Taper Screw Threads on Fusible Plugs and Valve Pads

6 FLOW CAPACITY OF FUSIBLE PLUG

6.1 General

The flow capacity of each design and modification shall be determined by an actual flow test by an approved method.

6.2 The minimum requirement of flow capacity of fusible plug shall be calculated from the following formula:

Q_a = 1.148 W_c m^3/h

Q_a = flow capacity at 686 ${}_{k}P_{a}$ (Absolute)/7Kgf/cm^2 (Absolute) in m^3/h of free air

where

W_c = Water capacity of the cylinder in liters which in any case shall not be taken as less than 10 litres.

6.3 The fusible alloy shall be removed from the orifice by heating the plug above the melting point of the fusible alloy. Three samples of each size and design and modification shall be tested for flow test. The design of the fusible plug shall be considered acceptable, if all the three samples meet the minimum requirement of flow capacity.

6.4 This test is for the design or modification approval and shall be considered as type test.

7 TEST OF FUSIBLE ALLOY

7.1 For each production batch, yield temperature test of fusible alloy shall be conducted as per **7.3.1** of IS 5903

7.2 The yield temperature shall confirm to the value given in **5**.

7.3 In case of failure two more samples shall be taken at random and tested according to **7.1**. The batch shall be acceptable if both samples meet the requirements of **5**.

8 EXTRUSION AND YIELD TEMPERATURE OF FUSIBLE PLUG

8.1 General

Plugs selected in accordance with **8.2** shall be installed in a test rig which shall as stimulate actual conditions of installation in a cylinder and tested in accordance with **8.3** and **8.4.**

8.2 Number of Samples for Test

From every production batch of complete fusible plugs of the same size, made from the same batch of fusible alloy, the number of plug shown in Table 1 shall be selected at random.

Table 1 Number of Fusible Plugs to be Tested
(*Clause* 8.2)

Sl No.	Number of fusible plug in batch	Sample Size (*Min*)
1	3 Upto and including 8	2
2	9 Upto and including 15	3
3	16 Upto and including 30	4
4	31 Upto and including 100	6
5	101 Upto and including 250	8
6	251 Upto and including 1000	10
7	1001 Upto and including 3,000	25

8.3 Test to Determine Resistance to Extrusion

Each sample shall be subjected to a controlled temperature of 55^{+2}_{-0} °C for 24 hours with air pressure of 3.35 MPa (34 kgf/cm^2) minimum on the end normally exposed to the contents of the cylinder. Sample shall be tested as per clause **7.3** and clause **2.3** of IS 5903.

8.4 Test for Determination of the Yield Temperature of a Fusible Plug

Each sample shall be tested for determination of the yield temperature as per clause **7.3.2.4** of IS 5903.

8.5 Criteria for Acceptance

If any of the samples fails to meet the requirements of **8.3** and **8.4** the entire batch of plugs shall not be accepted unless a retest is carried out in accordance with **8.6.**

8.6 Retest

If the manufacturer so desires, he may subject double the original number of samples, selected at random from the same batch, to identical tests. If all of these additional plugs meet requirements, the remaining plugs of the batch shall be acceptable. If any of the additional plugs fail, the entire batch shall not be accepted.

9 PNEUMATIC TEST

Each fusible plug shall be subjected to pneumatic test at pressure of 5.90 MPa (60 kgf/cm^2) and shall be checked for leakage.

10 FIXING OF FUSIBLE PLUGS

Before fixing of fusible plug, wrapping of its stem shall be done by P.T.F.E. Teflon tape. Wrapping shall commence at the small end of the sealant tape, the sealant tape shall be wound clock wise when looking from the bottom of the plug. The number of layers may be adjusted depending on thickness of the tape. The tape shall not be excessively stretched during wrapping and shall be carefully torn or cut. Tape shall be carefully worked into the plug thread profile. Tape shall be rolled back which protrudes beyond the bottom of the Fusible Plug thread to leave the bottom face of the plug thread clear of tape. The plug shall then be fitted to cylinder by hand prior to applying torque. The torque applied to Fusible Plug while fixing will be in the range of 20 N.m to 25 N.m.

11 MARKINGS

11.1 Each fusible plug shall be marked in a non critical area for the identification of the manufacturer and a code for tracing back the factory test results.

11.2 Each batch of fusible plug shall be supported with a test certificate indicating the followings:

a) Manufacturer's name and address;
b) Year of manufacture;
c) Batch number of fusible alloy;
d) Control Unit number for fusible plug body;
e) Yield temperature range; and
f) Flow capacity.

11.3 The format of a test certificate that is to be issued by the manufacturer with every batch of fusible plugs to the purchaser is given in Annex B.

11.4 BIS Certification Marking

11.4.1 Each fusible plug may also be marked with the Standard Mark.

11.4.2 The use of the BIS Certification Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made there under. The details of conditions under which a license for the use of Standard Mark may be granted to the manufacturers or the producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 3.3)

SAMPLING SCHEME FOR EVALUATION OF MECHANICAL PROPERTIES OF THE FUSIBLE PLUG BODY MATERIAL

A-1 SCALE OF SAMPLING

Raw material for fusible plug body of same material and size and manufactured under similar process of production shall constitute a lot.

A-2 Fusible plug body material shall be selected and examined for each lot separately for ascertaining their conformity to the requirement of mechanical properties.

A-3 The number of samples selected at random from a lot shall be as follows:

Lot Size (kg)	*Sample Size (Numbers)*
Up to 250	2
251 to 500	4
501 to 3000	8

A-4 CRITERIA FOR CONFORMITY

The lot shall be declared satisfactory if each sample passes the requirement of tensile and elongation tests.

A-5 RETEST

If the test specimen fails to meet the requirement of **A-4**, additional specimen equaling twice the number of sample size in the same lot shall be taken and tested. If any of these specimens fails to meet the requirement, the entire lot represented shall not be accepted.

ANNEX B

(*Clause* 11.3)

(MANUFACTURER NAME & ADDRESS)

MATERIAL TEST CERTIFICATE

Certificate No. : ______________________________ Date:

Name of the Buyer : ___________________________

Item Description : ____

Order No. : ____________________

Batch No. : _________________________________ Quantity: __________

Batch No. of fusible alloy: _____________________

This is to certify that – Fusible Plugs as mentioned above were manufactured and inspected by us. These plugs meet the requirement of IS: 13497, the result of Inspection is as follows:

Requirement		**Result**
Body material:	Extruded Brass Rod/SS	Brass/SS as per ___________________
Yield temperature of Fusibcle Plug:	98°C – 104°C	_________________________________
Inlet thread size:	1/8” -27 NGT	Checked by Thread Ring Gauge as per IS:_____________________________
Pneumatic Test requirement:	100% Quantity at Test Pressure-60 Kgf/cm^2	_________________________________

Flow Capacity: (To be given by Manufacturer)

Quantity Inspected: ___________________ Passed: ___________________ Rejected: __________________

Signature
(Quality Control Inspector)

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Gas Cylinders Sectional Committee, MED 16

Organization	*Representative*(*s*)
Petroleum and Explosive Safety Organization, Nagpur	Dr Sudarshan Kamal (***Chairman***) Shri Ashendra Singh (*Alternate*)
All India Industrial Gases Manufacturers Association, New Delhi	Shri Saket Tiku ShrimatiVeena Peter (*Alternate*)
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SICGIL India Ltd, Chennai	ShriS. Maragathavel ShriNauzerDadabhoy (*Alternate*)
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Organization	*Representative*(*s*)
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Member Secretary
Shri Chandan Gupta
Scientist 'B' (MED), BIS

Composition of Dissolved Acetylene Cylinders, Generators, Acetylene Pipe Lines and High Pressure Gas Cylinders Subcommittee, MED 16:3

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Amend No.	Date of Issue	Text Affected

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